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EARNINGS OF MILITARY VETERANS

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CENTER FOR NAVAL ANALYSES

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ABSTRACT

This research contribution analyzes the civilian earnings of a group of approximately 24,000 individuals who separated from all four branches of military service in FY 71. We find that potential civilian earnings grow while an individual remains in the military. However, they grow less rapidly than they will once the individual separates from the military. Therefore, the growth in potential civilian earnings is retarded as long as the individual remains in the military.

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INTRODUCTION

This report analyzes the civilian earnings of a group of approximately 24,000 individuals who separated from military service in FY 71. The group consists of individuals who separated from all four branches of military service, as well as individuals who separated along the entire spectrum of length-of-service values. The data include personal and military background characteristics of these individuals. In addition, we obtained the earnings covered under Social Security of these individuals for CY 72-CY 77. Hence, we are able to track the growth rate of civilian earnings in addition to the initial earnings upon separation.

Appropriate data sets and statistical techniques for studying the earnings of military veterans depend on the use for which the analysis is intended. Several studies (Cooper [1], Danzon [2], DeTray [3, 4], Norrblum [5]) have compared the earnings of military veterans to the earnings of a "control group" of individuals who are identical to the veterans except for never having served in the military. The purpose of these studies has been to determine whether military veterans earn more than their non-veteran counterparts. If so, the "veteran premium" in earnings is attributed to the superiority of military experience relative to an equal number of years of civilian experience.

While the existence of a veteran premium may be an interesting research question, we believe that it cannot be resolved using the conventional control group comparisons. The decision to enlist in the military is not random, and is at least partially determined by a comparison of potential military and potential civilian earnings streams. Even if two individuals appear otherwise identical, the fact that one individual chose to enlist while the other did not indicates a difference between the potential earnings streams of these two individuals. The observed earnings differences between these individuals may be the result of the differential effectiveness of military versus civilian training, but may also be the result of intrinsic unmeasured ability differences between these individuals. None of the control group comparisons have successfully distinguished between these two alternative explanations.*

We have not pursued the control-group-comparison approach, both because we believe it is futile and because our analysis is intended for

* It may be argued that enlistment decisions in our sample were not determined by income comparisons, since many individuals were either drafted or induced to enlist by the threat of being drafted. However, a control group comparison would not even be appropriate for draftees, since all draftees satisfied the military's mental and physical entrance standards while some individuals who never served either did not or could not have satisfied these standards.

a different ultimate purpose. Instead, we have focused exclusively on a sample of veterans. We have made internal comparisons among the civilian earnings of veterans who served military careers of various lengths. In this way we may determine the impact of additional military service on subsequent civilian earnings. Moreover, since we track civilian earnings for 6 years after separation from the military, we may compare the growth-rate of civilian earnings after separation to the growth-rate of potential civilian earnings while the individual is still in the military. That is, we may compare the effects of length of military experience with length of civilian experience in determining civilian earnings.

Our approach is free from the non-comparability biases of control-group comparisons, since all of the veterans in our sample both chose to enlist and satisfied all of the military's mental and physical entrance standards. Hence, our sample is relatively homogeneous. It may be argued that biases are present even in our internal comparisons, since the choice of length of military career is itself partially determined by a comparison of potential earnings streams. For example, it has been suggested that the most able military personnel will separate after short military careers, while only the less able personnel will choose long military careers. If so, we would underestimate the effect of military experience on potential civilian earnings, since longer military careers would only be observed among lower ability individuals. We are aware of this problem, and we have employed appropriate statistical techniques to correct for sample composition and yield unbiased estimates of the pure effect of military experience, holding ability constant.

Our approach not only yields less biased estimates, but is also better suited for our ultimate purpose. Our earlier work on enlisted retention (Warner [6], Warner and Simon [7], Warner and Goldberg [8]) has demonstrated that the retention decision is well explained by the difference between the military earnings stream from remaining in the military and the civilian earnings stream from leaving the military. That work employed the estimated civilian earnings streams reported in Ross and Warner [9]. Unfortunately, the Ross and Warner civilian earnings functions apply to only individuals who leave the military after a single term of service, and had to be extrapolated outside the range of data from which they were estimated. Our primary purpose in conducting the present analysis is to provide better civilian earnings functions for use in future retention studies. Our internal comparison approach is ideal for this purpose, since we are only interested in the earnings of veterans and, hence, a control of non-veterans is not necessary.

It should be borne in mind that our estimated civilian earnings streams may yield misleading results when applied to an analysis of accession rather than retention decisions. Our civilian earnings functions accurately represent the civilian earnings opportunities of

military personnel contemplating separation from the military. However, they may not accurately represent the post-service civilian earnings opportunities that a randomly chosen 18-year-old could expect if he were to first enlist in the military and later separate from the military. As we argued earlier, comparisons within our sample of veterans are much more meaningful than comparisons between veterans and non-veterans. Individuals who choose to enlist in the military are different from individuals who choose not to enlist. Our civilian earnings functions are based upon the experiences of the former group and, hence, may not apply to the latter group or to the population at large.

FINDINGS

We find that potential civilian earnings grow while an individual remains in the military. However, they grow less rapidly than they will once the individual separates from the military. Depending upon the military occupational category under consideration, potential civilian earnings grow at an annual rate of between 2.1 and 8.0 percent while an individual remains in the military. Actual civilian earnings of veterans grow at an annual rate of between 3.8 and 8.5 percent. With one minor exception, the growth rate of actual civilian earnings upon separation exceeds the growth rate of potential civilian earnings prior to separation in every case. Therefore, growth in potential civilian earnings is retarded as long as the individual remains in the military.

Our findings do not imply that the choice of a military career is irrational. First, active-duty military pay may exceed potential civilian pay during an individual's military career. In addition, there are many non-monetary factors that may make a military career attractive for some individuals. Finally, the retirement annuity provides a substantial attraction for individuals who retire after 20 or more years of service.

Our findings are consistent with the observation that most military careers are either very short or very long. A long military career will reduce potential civilian earnings more than a short military career, since the earnings loss is compounded over time. However, military careers of 20 or more years are more common since the retirement annuity serves to compensate for the earnings loss.

Our findings should not be the source of much surprise. Since the skills acquired in the military sector differ from those acquired in the civilian sector, we should not expect experience in the military sector to be a perfect, one-for-one substitute for experience in the civilian sector. A few years of military experience may be a close substitute for an equal number of years of civilian experience. However, a long military career clearly imparts skills that differ from those acquired in an equally long civilian career. Military service is at best an imperfect substitute for direct experience in the civilian sector.

THEORY

Analyses of civilian earnings profiles have found that the relationship between years of experience t, and the natural logarithm of earnings $\log E_t$, is approximately quadratic:

$$\log E_t = \log E_0 + b_1 t - b_2 t^2 \quad , \tag{1}$$

where E_0 measures "base" earnings capacity. This relationship may be derived from human capital theory under the assumption that the fraction of time spent in on-the-job training declines linearly.*

To adapt equation 1 for use in our analysis, we must consider the effects of military experience upon both base civilian earnings, or civilian earnings immediately upon leaving the military, and upon the subsequent rate of growth of civilian earnings. One possibility is that military experience serves to shift the civilian earnings profile in a parallel fashion without changing its slope. Figure 1 illustrates this possibility. The upper profile in figure 1 corresponds to an individual who never served in the military. The lower profile corresponds to an individual who served m years in the military before entering the civilian sector. This individual earns only E_m during his first year in the civilian sector, so that m years of military experience left him less qualified for civilian employment than his civilian counterpart having m years of civilian experience. More generally, E_m may be either on, above, or below the pure civilian earnings profile. To account for all of the possibilities, we assume that base civilian earnings $\log E_m$ are a quadratic function of years of military experience:

$$\log E_m = \log E_0 + a_1 m - a_2 m^2 \quad . \tag{2}$$

We also assume that the path of subsequent civilian earnings for the individual who leaves the military is parallel to the pure civilian

---

* See Mincer [10, 11] and Johnson [12]. Earnings functions have also been derived from optimal control theory, as in Haley [13] and Heckman [14, and 15]. While these earnings functions are theoretically superior to the simple quadratic function, they are highly non-linear and difficult to estimate.

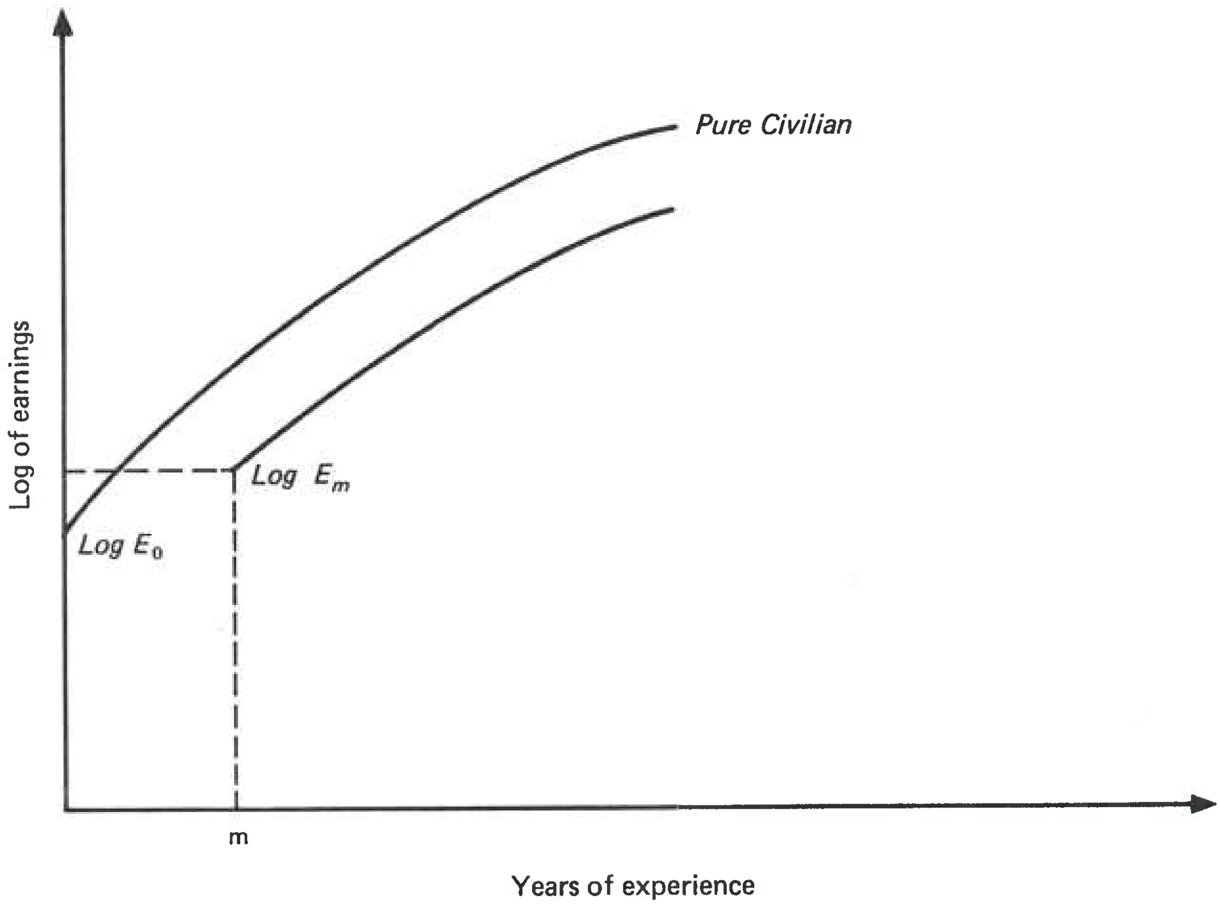

FIG. 1: POST-SERVICE EARNINGS PATH

earnings profile given by equation 1. From these two assumptions we can derive the post-service earnings profile:*

$$\log E_t = \log E_0 + (a_1 - b_1)m - (a_2 - b_2)\, m^2 + b_1 t - b_2 t^2 \quad , \tag{3}$$

where m measures years of military experience and t measures total years of experience. Defining years of civilian experience as $c = t - m$, we can express equation 3 as:

$$\log E_t = \log E_0 + a_1 m + b_1 c - a_2 m^2 - b_2 c^2 - 2b_2 mc \quad . \tag{4}$$

Figure 2 depicts the base earnings profile $\log E_m$ superimposed upon the pure civilian earnings profile for various values of a_1, a_2, b_1, and b_2. In all of these cases, we maintain the assumption that the path of civilian earnings (not shown in the figure) which begins on the base earnings profile will be parallel to the pure civilian earnings profile.

The base earnings profile lies completely below the pure civilian earnings profile for $a_1 < b_1$ and $a_2 > b_2$.** In this case, any individual who leaves the military after m years will always earn less than his civilian counterpart having an equal amount of total experience, regardless of the value of m. In effect, military service has imposed a permanent earnings loss equal to $(a_1-b_1)m - (a_2-b_2)m^2$ per year, measured in logarithms.

If $a_1 > b_1$, the base earnings profile lies above the pure civilian earnings profile, at least initially. The base earnings profile remains above the pure civilian earnings profile if $a_2 < b_2$. However, the base earnings profile eventually falls below the pure civilian earnings profile if $a_2 > b_2$. We view the latter case as being more likely. The first few years of military experience may provide skills that are highly transferable to the civilian sector. However, individuals who remain in the military for lengthy careers are being deprived of the

---

* To derive equation 3, note that the post-service earnings profile must have a slope equal to that of equation 1, or $d\log E_t/dt = b_1 - 2b_2 t$. Also, we know one point on this curve since for $t = m$, $\log E_m = \log E_0 + a_1 m - a_2 m^2$. Hence we have a first-order differential equation with a boundary condition. This differential equation is easily solved to yield equation 3.

** To derive this and the other cases, write the difference between the pure civilian earnings profile and the base earnings profile as: $(b_1 - a_1)\,t - (b_2 - a_2)t^2$. This expression equals zero at $t = 0$ and $t = (b_1 - a_1) / (b_2 - a_2)$. Hence the two profiles will intersect in the positive quadrant if and only if sign $(b_1 - a_1)$ = sign $(b_2 - a_2)$.

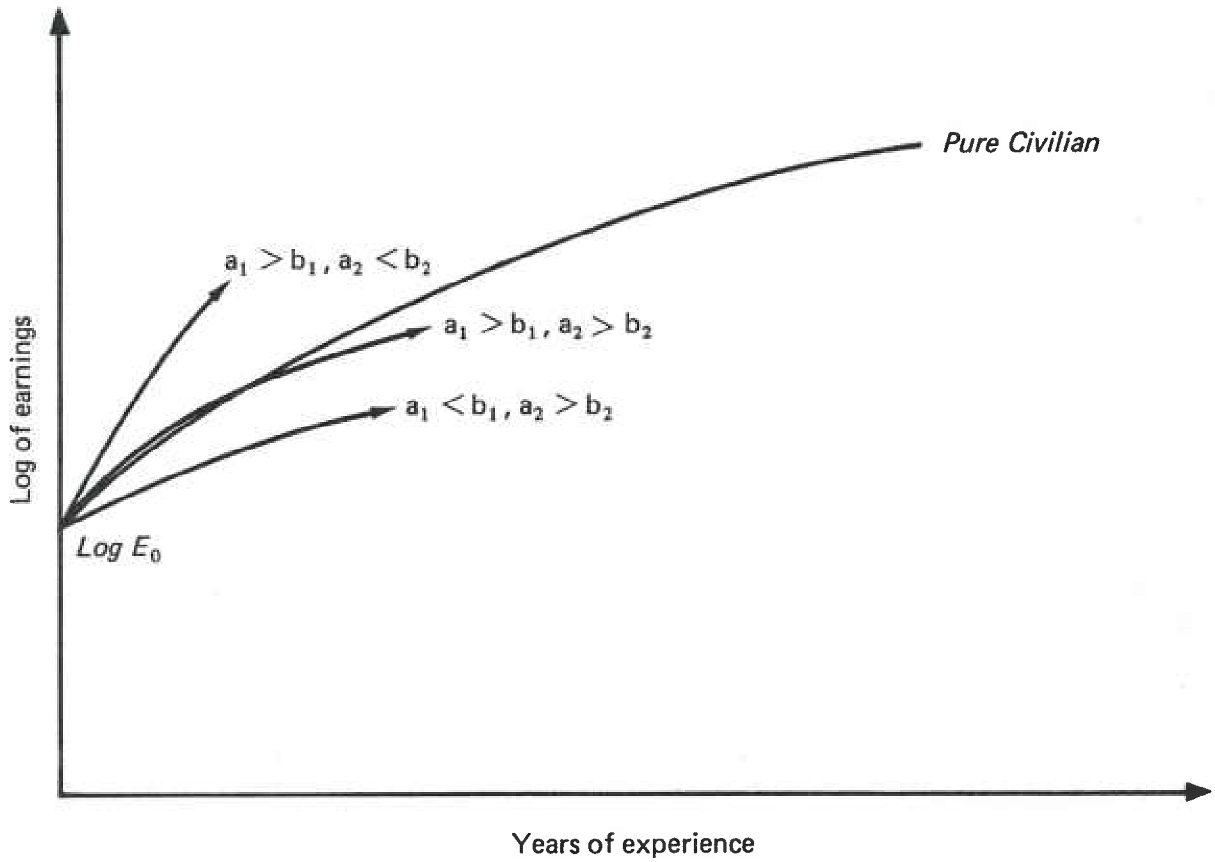

FIG. 2: BASE CIVILIAN EARNINGS PATH

specific skills and training relevant to civilian employment that their civilian counterparts are receiving. Hence, individuals separating after lengthy military careers are probably ill-prepared to compete for civilian employment opportunities.

Finally, figure 3 depicts the perverse case in which $a_1 < b_1$ and $a_2 < b_2$. In this case, the base earnings profile lies below the pure civilian earnings profile initially but eventually overtakes it. This corresponds to a case in which later military training is more highly transferable to the civilian sector than is early military training.

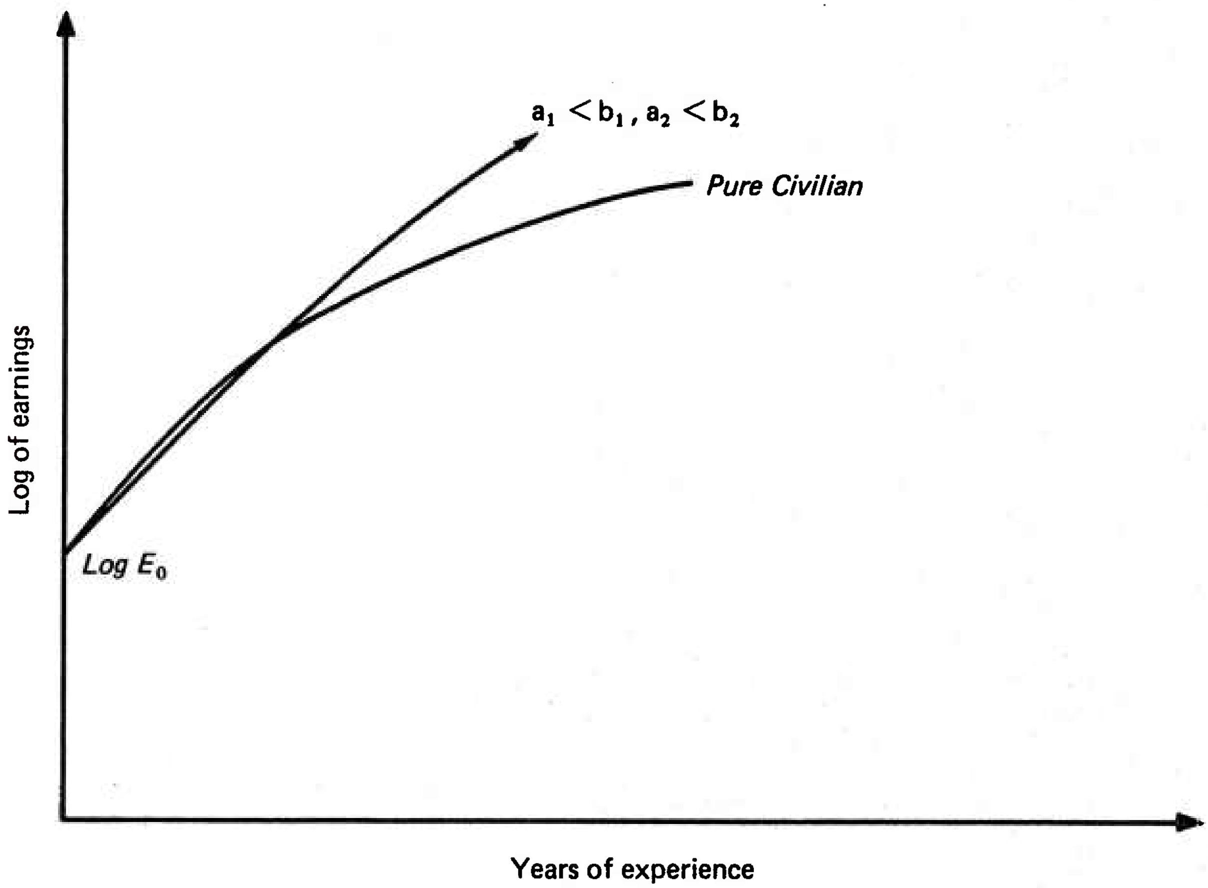

FIG. 3: PERVERSE EARNINGS PATH

DATA

DATA SET CONSTRUCTION

Our data set contains the Social Security reported earnings for the 6 years CY 72–CY 77 of a cohort of approximately 24,000 enlisted personnel who separated from the military in FY 71. To construct this data set, we first grouped all FY 71 separatees into cells based upon branch of service, two-digit DoD occupational group, and length of service (LOS) at the date of separation. We sampled the 30 largest two-digit military occupational groups within each of the four branches of service, as enumerated in table 1. We grouped the data into eight LOS intervals: LOS 2-3, LOS 4-5, LOS 6-7, LOS 8-10, LOS 11-15, LOS 16-20, LOS 21-25, and LOS 26-30. This grouping yielded a total of 960 possible cells, of which 684 were non-empty.

Our basic data file was constructed by randomly selecting 40 individuals from those cells containing at least 40 individuals, or the entire population from those cells containing fewer than 40 individuals. No cell contained fewer than 30 individuals. We sent a computer tape to the Social Security Administration containing the Social Security numbers of the individuals selected from each cell. For confidentiality reasons, the Social Security Administration could not provide us with data at the individual level. Rather, they provided us with a computer tape containing the mean and standard deviation of Social Security reported earnings within each cell for each of the 6 years CY 72–CY 77. This tape contained six annual observations on each of the 684 non-empty cells.*

For individuals with earnings greater than the Social Security maximum, only the Social Security maximum is reported. Therefore, the data underlying the computation of the mean and standard deviation of earnings within each cell are truncated from above at the Social Security maximum. As a result, both the mean and standard deviation of reported earnings are downward biased estimates of their true (population) values. Fortunately, the Social Security Administration provided us with the number of individuals earning the Social Security maximum in each cell. We used this information to correct for the bias (see appendix A).

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* We directed the Social Security Administration to eliminate individuals with zero reported earnings before calculating the cell mean and standard deviation of earnings. The zero earners were presumably either Federal government employees, full-time students, or individuals experiencing a lengthy spells of unemployment. This procedure reduced the cell size below 40 for the cells in which zero earners were encountered. We found about five to ten zero earners per cell on average, although this number was as large as 20 for certain cells.

TABLE 1

OCCUPATIONAL BREAKDOWN

One-digit occupational category	Two-digit occupational category	Services represented[a]			
0	Infantry/combat				
	01 Infantry	A	N	AF	MC
	03 Combat engineer	A			MC
	04 Artillery	A	N		MC
	05 Air crews			AF	
	06 Seamanship		N		
1	Electronic Equipment Repair				
	10 Radio	A	N	AF	MC
	11 Fire control systems			AF	
	12 Missile guidance systems	A	N		MC
	16 Teletype equipment	A	N		MC
	19 Other			AF	
2	Communications/Intelligence				
	20 Radio	A	N		MC
	22 Sonar		N	AF	MC
	23 Radar		N	AF	MC
	24 Intelligence	A		AF	
	25 Combat operations control	A			
3	Medical				
	30 Medical care	A	N	AF	
	31 Technical medical service	A	N	AF	
	32 Related medical service	A			
	33 Dental care		N	AF	
4	Other Technical				
	40 Photograph	A	N	AF	MC
	41 Mapping	A	N	AF	MC
	42 Weather			AF	
	43 Ordnance		N		
	45 Musicians	A			MC
5	Administrative/Clerical				
	50 Personnel	A	N		
	51 Administration	A	N	AF	MC
	52 Clerical				MC
	55 Functional support	A	N	AF	MC
	58 Communications center operations			AF	

TABLE 1 (Cont'd)

One-digit occupational category	Two-digit occupational category	Services represented[a]			
6	Mechanical Equipment Repair				
	60 Aircraft	A	N	AF	MC
	61 Automotive	A		AF	MC
	64 Armament	A		AF	MC
	65 Shipboard propulsion		N		
	66 Power generation		N		
7	Craftsmen				
	70 Metalworking	A			MC
	71 Construction	A	N	AF	
	72 Utilities		N		
	73 Construction equipment				MC
	74 Lithography	A			
	78 Firefighting				MC
	79 Other		N		
8	Service/Supply				
	80 Food service	A	N	AF	MC
	81 Motor transport	A			MC
	82 Materials receipt		N	AF	MC
	83 Law enforcement	A		AF	

[a]Key: A = Army, N = Navy, AF = Air Force, MC = Marine Corps.

We merged the Social Security tape with data from military history records on the percent white, the average education level, and average terminal paygrade within each cell. Finally, earnings for various years were deflated to 1972 values using the consumption component of the Gross National Product deflator. Tables 2 and 3 contain the means of all the variables by one-digit occupational category.

DATA LIMITATIONS

The data impose several limitations on our analysis. First, the use of cell averages rather than individual observations results in a loss of information and, hence, less precise estimates. This loss of information is unfortunate but unavoidable, since confidentiality restrictions prevented the Social Security Adminstration from releasing individual observations. Haitovsky [16] has analyzed the possible biases that may result from the use of cell averages. His major finding is that the bias becmes less severe as the number of characteristics used to define the cell increases. Since we used three characteristics (branch of service, DoD occupational group, and length of service) to define our cells, we do not expect this source of bias to be serious.

Second, while zero earners were excluded from each cell before the mean and standard deviation of earnings were calculated, part-time earners were not. For example, some individuals may have worked part-time and attended school part-time. We have no way of identifying these individuals. Therefore, our mean earnings may underestimate the potential earnings that the individuals in our sample could have received under full-time employment.

In addition, while the zero earners were excluded from the earnings calculations, they were included in the calculation of the average background characteristics (percent white, average education level, average terminal paygrade) from the military history records. This was necessary since we could not identify the particular individuals who had zero reported earnings, only the number of such individuals in each cell. Hence the average background characteristics refer to a slightly different sample from the mean earnings. The resulting bias will be small as long as the background characteristics of the zero earners do not significantly differ from those of the positive earners.

COLLINEARITY PROBLEMS

We estimated equation (4) separately for each one-digit occupational category. The number of observations for each regression equals the number of non-empty cells in that occupational category times six, since there are 6 years of earnings data for each cell. We chose to analyze the data by one-digit occupational category to examine whether the effect of military training and experience varies with the military occupation in which the individual was trained. We also included the percent white and the average educational level of each cell in the

TABLE 2

CHARACTERISTICS OF SAMPLE BY YEARS OF MILITARY EXPERIENCE AND ON-DIGIT DOD OCCUPATION[a]

One-digit DoD occupation		Years of military experience: 2-3	4-5	6-7	8-10	11-15	16-20	21-25	26-30
Infantry/combat	ED	11.7	11.8	11.4	11.6	11.5	11.4	11.6	11.6
	%W	.71	.83	.85	.78	.74	.73	.89	.74
	APG	3.4	4.04	4.23	4.73	5.31	6.45	6.75	7.53
Electronic equipment repair	ED	12.2	12.4	12.2	12.0	12.0	11.9	11.9	12.0
	%W	.73	.65	.66	.83	.92	.64	.65	.69
	APG	3.46	4.41	4.80	5.26	5.53	6.23	7.09	7.59
Communications/ Intelligence	ED	12.1	12.3	12.1	11.9	11.9	11.7	11.8	11.8
	%W	.74	.50	.84	.89	.73	.75	.76	.58
	APG	3.51	4.36	4.65	5.21	5.63	6.54	7.07	7.63
Medical	ED	12.5	12.4	12.4	12.0	12.1	11.6	11.9	11.9
	%W	.88	.70	.79	.87	.81	.77	.86	.70
	APG	3.48	4.38	4.62	5.10	5.44	6.25	6.59	7.39
Other Technical	ED	12.4	12.5	12.4	12.0	11.9	10.9	11.9	12.2
	%W	.61	.69	.58	.91	.88	.95	.75	.58
	APG	3.97	4.41	4.81	5.01	5.17	6.45	6.87	7.23
Administrative/ Technical	ED	12.1	12.2	12.0	11.7	11.9	11.8	11.8	11.8
	%W	.79	.93	.78	.83	.83	.76	.81	.78
	APG	3.52	4.26	4.54	4.80	5.36	6.19	6.92	7.57
Mechanical equipment repair	ED	11.7	12.0	11.8	11.7	11.7	11.6	11.6	11.7
	%W	.85	.94	.75	.81	.88	.80	.92	.80
	APG	3.15	4.19	4.47	4.88	5.24	6.25	6.69	7.49

TABLE 2 (Cont'd)

One-digit DoD occupation		Years of military experience							
		2-3	4-5	6-7	8-10	11-15	16-20	21-25	26-30
Craftsmen	ED	11.8	11.8	11.7	11.4	11.6	11.4	11.6	11.6
	%W	.89	.71	.62	.89	.84	.72	.48	.84
	APG	3.62	4.18	4.32	4.72	5.33	6.28	6.67	7.20
Service/supply	ED	11.7	11.7	11.6	11.6	11.6	11.6	11.5	11.4
	%W	.78	.84	.77	.74	.76	.77	.77	.75
	APG	3.21	3.84	4.07	4.48	4.87	5.65	6.38	7.24

[a]Key: ED = average years of education
%W = percent white
APG = average terminal paygrade.

TABLE 3

AVERAGE POST-SERVICE EARNINGS, ALL YEARS 1972-1977, BY MILITARY EXPERIENCE AND ONE-DIGIT DOD OCCUPATION[a]

One-digit DOD occupation	Years of military experience							
	2-3	4-5	6-7	8-10	11-15	16-20	21-25	26-30
Infantry/combat	7,191	6,954	6,519	7,534	7,503	7,258	6,688	6,827
Electronic equipment repair	7,722	8,762	9,436	10,204	10,984	8,977	8,725	7,407
Communications/Intelligence	7,185	7,942	7,790	8,098	8,681	7,969	7,624	6,258
Medical	7,249	7,265	8,177	10,128	8,998	8,413	8,358	7,647
Other technical	7,269	7,571	8,275	8,434	9,857	11,319	8,229	6,208
Administrative/Clerical	7,632	7,409	7,245	7,158	8,358	7,316	7,430	6,896
Mechanical equipment repair	6,470	8,211	8,003	8,794	8,133	7,645	7,464	6,435
Craftsmen	8,300	8,197	7,562	7,872	8,103	8,309	6,919	6,480
Service/supply	6,527	6,981	6,596	7,062	7,739	6,383	6,832	6,808

[a]Corrected for truncation bias (see Appendix A) and expressed in 1972 dollars.

regression to control for personal background characteristics which may affect civilian earnings. We were forced to omit average paygrade from the regression because it was highly collinear with length of military service.*

In addition, we were unable to include both c and c^2 in the regression, since they are highly collinear due to the short time span (6 years) of our civilian earnings data. There are several approaches to resolving this problem. One is to simply omit c^2 from the regression. This would still enable us to estimate the parameter b_2 since the coefficient on the interaction variable mc is equal to $-2b_2$. However, it would preclude a test of the proportionality between the coefficients on c^2 and on mc. Moreover, the omission of c^2 would bias the estimates of the coefficients on the remaining variables. It can be shown that our estimate of b_1 would be downward biased, and our estimate of b_2 derived from the coefficient on mc would be upward biased.

It should be recognized that omission of c^2 amounts to imposition of a false linear restriction on the vector of regression coefficients. There is no reason to believe that omission of c^2 constitutes the optimal linear restriction to impose on the data. Instead, we decided to include c^2 but constrain its coefficient to equal one-half of the coefficient on mc, as in equation 4. This procedure only yields a single estimate of the parameter b_2. The estimate of b_2 is unbiased if the restriction is true. The estimate is biased if the restriction is false, but may still have a smaller mean square error (variance plus squared bias) than an unrestricted estimate (see Toro-Vizcarrondo and Wallace [17]).

A further problem is that the earnings numbers in table 3 overestimate the potential civilian earnings of the average individual in the military because those individuals who chose to leave the military are presumably the ones whose potential civilian earnings are the highest (appendix B). Moreover, the use of these numbers in a regression analysis will lead to biased estimates of the effects of military and civilian experience on potential civilian earnings. To avoid this source of bias, we have adopted the Lee and Trost [18] procedure to obtain unbiased estimates from a censored data set. This procedure entails the introduction of a set of "selectivity instruments" into the regresson equation (see appendix B).

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* Thus our results should be interpreted as estimates of the post-service earnings path for an individual who follows a normal promotion pattern. Other studies (See Ross and Warner [9]) using individual data, in which there is considerable variation in terminal paygrade at a given military experience level, do in fact find paygrade to explain a significant portion of post-service earnings. At a given experience level, paygrade is another indicator of worker quality.

COHORT AND GROWTH EFFECTS

There is a potential "cohort bias" in our estimates of equation (4). Our coefficients on m and m^2 are intended to measure the effects of military experience on civilian earnings. However, recall that all of the individuals in our sample left the military in FY 71, and also that most of these individuals entered the military at about age 18. Therefore, age is almost perfectly positively correlated with length of military service in our sample. For example, an individual who left the military after 10 years of service in 1971 was born in 1943 and entered the military in 1961 at age 18. An individual who left the military after 11 years of service in 1971 was born in 1942 and entered the military in 1960 at age 18. Therefore, the individual with 11 years of military service was born and educated one year earlier than the individual with only 10 years of military service.

The results of several studies (see Haley [13], Johnson and Hebein [19], and Rosen [20]) suggest that earnings are lower for older birth cohorts who were educated in earlier calendar years. In our sample, higher values of military experience are indexing older-birth cohorts. Here our coefficient on military experience is measuring the net difference between the positive effect of military training on civilian earnings and the negative effect of cohort age on civilian earnings. Therefore, our coefficient on m is a downward biased estimate of the pure training effect of military service.

Moreover, our coefficient on c is an upward biased estimate of the effect of civilian experience on civilian earnings. Recall that our coefficients on c and c^2 are estimated by following the FY71 separation cohort through six years of civilian experience. However, their earnings growth reflects not only the pure effect of civilian training, but also the general improvements in productivity and economic growth that took place over the six year period. Hence while our coefficient on m is downward biased, our coefficient on c is upward biased.

More formally, consider a birth cohort that entered the military in calendar year v, where $v=0$ corresponds to the oldest birth cohort represented in our sample. This cohort served in the military for m years, and will have c years of civilian experience in calendar year $v+m+c$. We assume that general economic growth occurs at the constant exponential rate of g per year. Hence in the absence of any training effect, general economic growth alone would cause earnings in calendar year $v+m+c$ to exceed earnings in calendar year 0 by the multiplicative factor $e^{g(v+m+c)}$. This implies that the logarithm of earnings in calendar year $v+m+c$ exceeds the logarithm of earnings in calendar year 0 by the additive factor $g(v+m+c)$.

Also, equation 2 still expresses base civilian earnings as a function of years of military service. However, the term $\log E_o$ must be

modified to reflect the effect of cohort age on civilian earnings opportunities. We assume that cohort effects cause base civilian earnings to grow at the constant exponential rate of γ per year as we move across successively younger cohorts. Hence if $E_{o,v}$ denotes base civilian earnings of the cohort that entered the military in calendar year v, we may write:

$$E_{o,v} = E_{o,o}\, e^{\gamma v} \quad \text{or} \quad \log E_{o,v} = \log E_{o,o} + \gamma v. \tag{5}$$

In light of this discussion, equation 4 must be modified in three ways. First, substitute the expression for $\log E_{o,v}$ to account for the cohort effect. Second, add in the term $g(v+m+c)$ to account for general economic growth. With these two modifications, equation 4 becomes

$$\log E_t = \log E_{o,o} + (a_1 + g)m + (b_1 + g)c - a_2 m^2 - b_2 c^2 - 2b_2 mc + (g + \gamma)v \tag{6}$$

Finally, recall that all individuals in our sample left the military in the same calendar year, implying the identity $v+m = s$ where s is the common year of separation. Substitution of this identity into equation (6) enables us to eliminate v from the equation, yielding:

$$\log E_t = \log E_{o,o} + (g + \gamma)\, s + (a_1 - \gamma)m + (b_1 + g)c - a_2 m^2 - b_2 c^2 - 2b_2 mc\ . \tag{7}$$

We see that the intercept of the regression must be reinterpreted as an estimate of the entire term in brackets. Moreover, the coefficient on m is downward based due to the cohort effect, γ, while the coefficient on c is upward biased due to the growth effect, g. To remove these biases, we have used external estimates of γ and g taken from Rosen [20]. He estimates the sum $\gamma+g$ to be .022 for high school graduates, and he attributes .006 to γ and .016 to g. Therefore, we have adjusted our coefficient on m upward by .006 to correct for the cohort bias, and adjusted our coefficient on c downward by .016 to correct for the growth bias.

While the decomposition of the sum $\gamma+g$ is necessary to obtain separate unbiased estimates of a_1 and b_1, identification of the various cases depicted in figures 2 and 3 only requires knowledge of

whether a_1 is greater than or less than b_1. Hence an unbiased estimate of the difference (a_1-b_1) is sufficient for this purpose. Observe from equation (7) that the difference between the coefficients on m and c yields an estimate of $(a_1-b_1) - (\gamma+g)$. An unbiased estimate of (a_1-b_1) is obtained by adding to this difference an external estimate of $(\gamma+g)$. Therefore, our choice of $(\gamma+g) = .022$ is critical to the identification of the cases depicted in figures 2 and 3. We shall note later on the sensitivity of our results to this particular choice of $(\gamma+g)$.

DISINCENTIVE EFFECTS

Individuals who retire from the military after 20 or more years of service receive a lifetime annuity equal to .50 + .025 (T-20) times terminal base pay, where T is terminal length of service. For example, the annuity equals 50 percent of terminal base pay after 20 years of service, and 75 percent of terminal base pay after 30 years of service.

Individuals who retire with an annuity may experience a disincentive effect which causes them to work fewer hours and hence receive lower annual earnings. Recall that our goal is to estimate the determinants of potential earnings, or the earnings that the individual would receive if he worked full-time. For individuals in our length of service intervals LOS 21-25 and LOS 26-30, actual earnings may seriously understate potential earnings if they work fewer hours. Moreover, since the earnings associated with high values of m are understated, the estimated coefficient on m will be downward biased.

To remove this bias, we have included the value of the retirement annuity in our regression equations . This variable equals zero for all LOS intervals except LOS 21-25 and LOS 26-30. For these two intervals, the annuity variable is computed as the appropriate fraction of terminal base pay, where terminal base pay is computed on the basis of average terminal paygrade in each cell.

The coefficient on the annuity variable measures the effect of the pension, and should be negative in sign. More importantly, inclusion of the annuity variable removes the bias in the coefficients of the remaining variables, so that we are accurately measuring the effects of these variables on potential full-time earnings.

ESTIMATES

Table 4 reports our regression estimates of equation (4) for each of the nine occupational categories. Table 5 reports the selectivity coefficients from the same regressions (see appendix B). Many of the selectivity coefficients are statistically significant, indicating that the sample composition indeed varies with length of military service. We will not discuss the signs of the selectivity coefficients, since they do not have a meaningful interpretation.

The coefficients in table 4 imply that each additional year of education serves to increase the earnings of veterans by between 5.6 and 20.5 percentage points. With three exceptions, white veterans earn between 2.0 and 30.6 percent more than non-white veterans. Finally, receipt of a retirement annuity significantly reduces the earnings of veterans in only two of the occupational categories.

We used the coefficients in table 4 to identify the structural parameters of our model. The structural parameters estimates are reported in table 6. Our estimate of a_1 equals the coefficient on m plus a cohort correction of .006. Our estimate of b_1 equals the coefficient on c minus a growth correction of .016. Our estimate of a_2 equals the absolute value of the coefficient on m^2. Finally, our estimate of b_2 equals the absolute value of the coefficient on c^2 or, equivalently, one-half the absolute value of the coefficient on mc.

We find that b_1 exceeds a_1 for all of the occupational categories except Other Technical. However, we noted earlier that this result is sensitive to our choice of cohort and growth correction factors. The difference between a_1 and b_1 in table 6 is equal to the difference between the coefficients on m and c in table 4 <u>plus</u> the sum of the cohort and growth correction factors. Larger correction factors would increase $(a_1 - b_1)$ and tend to reverse our finding that b_1 exceeds a_1; smaller correction factors would tend to reinforce this finding. We doubt that larger correction factors would be appropriate, since Rosen's growth correction of .016 based upon the period 1960-1970 is probably too high for our sample period.* Hence, we have probably overestimated the difference $(a_1 - b_1)$, and our finding that b_1 exceeds a_1 is reinforced.

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* For example, gross weekly earnings in the manufacturing sector only grew at a real annual rate of .011 over the six year period CY 1971 - CY 1977. Gross weekly earnings in the private non-agricultural sector actually declined over this period.

TABLE 4

REGRESSION ESTIMATES[a] OF EQUATION 4

One-digitoccupational category	Intercept	Percent white	Education	Retirement annuity	m	c	m^2	c^2	mc	Sample size	R-squared
Infantry/Combat	6.946	0.098 (3.00)	0.082 (3.31)	-0.00019 (3.11)	0.025 (6.23)	0.064 (7.84)	-0.0006 (4.90)	-0.0010 (4.47)	-0.0020 (4.47)	468	.510
Electronic Equipment Repair	7.530	0.076 (3.93)	0.098 (4.22)	0.00000 (0.00)	0.059 (14.01)	0.087 (9.92)	-0.0017 (13.59)	-0.0011 (4.86)	-0.0023 (4.85)	492	.465
Communications/ Intelligence	7.438	-0.039 (1.90)	0.067 (2.85)	0.00000 (0.00)	0.046 (10.61)	0.086 (10.27)	-0.0013 (10.10)	-0.0013 (5.62)	-0.0026 (5.62)	498	.432
Medical	7.73	0.046 (1.03)	0.170 (4.71)	-0.00038 (3.81)	0.074 (11.38)	0.101 (8.99)	-0.0017 (9.05)	-0.0014 (4.46)	-0.0028 (4.46)	348	.582
Other Technical	8.036	-0.014 (0.44)	0.056 (1.81)	-0.00008 (0.61)	0.066 (8.75)	0.084 (7.80)	-0.0019 (7.91)	-0.0012 (3.18)	-0.0024 (3.18)	300	.493
Administrative/Clerical	7.078	0.046 (1.36)	0.103 (4.09)	0.00008 (1.18)	0.025 (5.86)	0.085 (9.90)	-0.0005 (3.95)	-0.0013 (5.88)	-0.0027 (5.88)	564	.294
Mechanical Equipment Repair	6.454	-0.118 (3.31)	0.179 (6.39)	0.00002 (0.36)	0.039 (9.97)	0.064 (7.77)	-0.0011 (9.74)	-0.0009 (3.86)	-0.0018 (3.86)	552	.502
Craftsmen	5.925	0.020 (0.67)	0.205 (6.49)	-0.00009 (0.90)	0.015 (2.57)	0.054 (5.11)	-0.0004 (2.15)	-0.0008 (2.49)	-0.0015 (2.49)	318	.469
Service/Supply	7.365	0.306 (4.49)	0.063 (4.45)	0.00000 (0.00)	0.021 (5.67)	0.063 (7.97)	-0.0004 (3.23)	-0.0010 (4.86)	0.0020 (4.86)	522	.311

[a]Absolute values of t-statistics appear in parentheses.

TABLE 5

ESTIMATES OF SELECTIVITY COEFFICIENTS[a] IN EQUATION 4

One digit Occupational Category	α_1	α_2	α_3	α_4	α_5	α_6	α_7	α_8
Infantry/Combat	5.457	-5.084	1.883	-0.091	-18.433	10.361	-23.314	45.769
	(4.07)	(3.68)	(2.46)	(0.06)	(4.13)	(3.07)	(3.36)	(3.57)
Electronic Equipment Repair	-1.499	0.637	1.224	0.712	1.199	-3.675	4.550	-12.499
	(2.62)	(2.52)	(2.15)	(0.77)	(0.72)	(2.19)	(1.89)	(2.00)
Communications/ Intelligence	-0.514	0.589	1.315	-1.166	7.554	1.835	-10.108	14.747
	(1.68)	(3.49)	(2.13)	(1.69)	(4.84)	(1.99)	(4.74)	(4.94)
Medical	-3.328	4.332	-3.253	0.162	-5.291	-7.889	-3.658	-34.703
	(4.39)	(7.11)	(3.93)	(0.12)	(1.69)	(5.46)	(1.94)	(7.57)
Other Technical	-2.983	2.854	-2.363	-0.415	0.945	-5.352	-2.835	13.649
	(4.19)	(5.15)	(1.39)	(0.79)	(0.30)	(3.92)	(1.30)	(3.23)
Administrative/ Clerical	-0.840	1.254	0.827	-0.163	3.154	-8.374	7.598	8.699
	(1.55)	(2.55)	(0.75)	(0.07)	(0.68)	(3.44)	(3.50)	(2.81)
Mechanical Equipment Repair	0.051	0.713	4.450	-11.187	3.531	-2.853	3.777	4.989
	(0.14)	(2.81)	(5.87)	(4.46)	(1.47)	(3.04)	(2.29)	(2.90)
Craftsmen	7.023	-4.245	4.098	-14.381	-20.640	1.193	13.296	-23.64
	(3.02)	(2.44)	(3.03)	(3.28)	(2.70)	(0.51)	(1.31)	(1.46)
Service/Supply	-2.197	1.824	-6.359	6.702	0.796	-2.675	7.644	-27.108
	(2.48)	(2.31)	(4.21)	(1.76)	(0.10)	(1.16)	(0.83)	(0.97)

[a]Absolute values of t-statistics appear in parentheses.

TABLE 6

ESTIMATES OF STRUCTURAL PARAMETERS

One-digit occupational category	a_1	b_1	a_2	b_2
Infantry/Combat	.031	.048	.0006	.0010
Electronic Equipment Repair	.065	.071	.0017	.0011
Communications/Intelligence	.052	.070	.0013	.0013
Medical	.080	.085	.0017	.0014
Other technical	.072	.068	.0019	.0012
Administrative/Clerical	.031	.069	.0005	.0013
Mechanical Equipment Repair	.045	.048	.0011	.0009
Craftsmen	.021	.038	.0004	.0008
Service/Supply	.027	.047	.0004	.0010

Referring to figure 2, the fact that a_2 exceeds b_2 for the Other Technical category implies that the base earnings profile lies below the pure civilian earnings profile, at least eventually. For the other eight occupational categories, we have established that b_1 exceeds a_1 and we must now examine the relationship between a_2 and b_2. We find that a_2 equals b_2 for the Communications/Intelligence category, a_2 exceeds b_2 for Electronic Equipment Repair, Medical, and Mechnical Equipment Repair, but b_2 exceeds a_2 for Infantry/Combat, Administrative/Clerical, Craftown, and Service/Supply. The base earnings profile lies completely below the pure civilian earning profile for the four occupational categories in which a_2 either equals or exceeds b_2. However, the four occupational categories in which b_2 exceeds a_2 fall into the perverse case depicted in figure 3.

To examine these four occupational categories more closely, we computed the crossover points $t^* = (b_1 - a_1)/(b_2 - a_2)$ at which the base earnings profile overtakes the pure civilian earnings profile. These crossover points are reported in table 7. The crossover points all exceed 30 years. However, since military careers do not exceed 30 years, the base earnings profile lies below the pure civilian earnings profile throughout the entire range of interest.

We concluded that the base earnings profile lies completely below the pure civilian earnings profile for all of the occupational categories except Other Technical. The base earnings profile for the Other Technical category lies above the pure civilian earnings profile for military careers of length 5.71 years or less, but lies below the pure civilian earnings profile for careers of length greater than 5.71 years.

Moreover, the 5.71 years period would be shortened if we adopted smaller cohort or growth correction factors.

TABLE 7

ESTIMATES OF CROSSOVER POINTS

One-digit occupational category	Crossover point
Infantry/Combat	42.50
Administrative/Clerical	47.50
Craftsmen	42.50
Service/Supply	33.33

INTERPRETATION

Although potential civilian earnings grow while an individual remains in the military, they grow less rapidly than they will once the individual separates from the military. Therefore, continued military service implies a deterioration in civilian opportunities relative to what they would be upon immediate separation.

Since we do not employ a control group of non-veterans, our results cannot be used to compare the earnings of veterans to the earnings of non-veterans. However, we argued earlier that such comparisons are unenlightening since the veteran population is fundamentally different from the non-veteran population. What our results do indicate is that among the population of individuals who chose to enlist in the military, growth in potential civilian earnings is retarded as long as these individuals remain in the military.

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APPENDIX A

CORRECTION FOR TRUNCATION BIAS

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CORRECTION FOR TRUNCATION BIAS

Our data set contains cell averages of earnings that were eligible for Social Security taxation. For individuals with earnings greater than the Social Security maximum, only the Social Security maximum is reported. Therefore, the earnings data underlying the computation of the cell averages are truncated from above at the Social Security maximum. As a result, both the mean and the variance of earnings in each cell are underestimates of their true (population) values.

We may remove the truncation bias in our data if we are willing to assume that earnings are normally distributed in the population, with mean μ and variance σ^2. If Y denotes earnings and B denotes the Social Security maximum, then the mean and variance of earnings in each cell are unbiased estimates of $E(Y|Y < B)$ and $Var(Y|Y < B)$, respectively. Johnson and Kotz [21, pp. 81-87] have shown that:

$$E(Y|Y \leq B) = \mu - \sigma \frac{f(Z)}{F(Z)} \tag{A-1}$$

and:

$$Var(Y|Y \leq B) = \sigma^2 \left[1 - Z \frac{f(Z)}{F(Z)} - \left(\frac{f(Z)}{F(Z)}\right)^2\right] \tag{A-2}$$

where f is the standard normal density function, F is its distribution function, and $Z = (B-\mu)/\sigma$. Within each cell, we know the fraction of individuals having earnings below the Social Security maximum. This fraction, p, provides a consistent estimate of $F(Z)$. Applying the inverse standard normal distribution function, we may compute consistent estimates of Z and $f(Z)$, as follows.

$$Z = F^{-1}(p) \tag{A-3}$$

$$f(Z) = f\left[F^{-1}(p)\right] \tag{A-4}$$

Using these estimates, equation (A-2) may be solved for σ^2 as a function of p and our sample estimate of $\mathrm{Var}(Y|Y \leq B)$. Equation (A-1) may then be solved for μ as a function of σ^2, p, and our sample estimate of $E(Y|Y < B)$. We may then proceed with a regression analysis to express μ as a function of background characteristics.

APPENDIX B

CORRECTION FOR SELF-SELECTIVITY BIAS

APPENDIX B

CORRECTION FOR SELF-SELECTIVITY BIAS

We observe the civilian earnings of only those individuals who chose to leave the military. Presumably, these are the individuals whose potential civilian earnings exceed the potential earnings from remaining in the military. Therefore, we expect that the actual civilian earnings of those who leave the military will overstate the potential civilian earnings of those who do not leave. We will derive the precise conditions under which this result obtains.

We express potential civilian earnings as a linear function of a set of measurable characteristics, X_1:

$$Y_1 = X_1\beta_1 + u_1 \tag{B-1}$$

We express potential military earnings as a linear function of some other set of measurable characteristics, X_2, where X_1 and X_2 may have some columns in common:

$$Y_2 = X_2\beta_2 + u_2 \tag{B-2}$$

The individual will leave, and his potential civilian earnings will be observed, if and only if:

$$u_2 - u_1 \leq X_1\beta_1 - X_2\beta_2 \tag{B-3}$$

Define $u_3 = u_2 - u_1$, so that $\mathrm{Var}(u_3) = \sigma_{33} = \sigma_{11} + \sigma_{22} - 2\sigma_{12}$, $\mathrm{Cov}(u_1,u_3) = \sigma_{13} = \sigma_{12} - \sigma_{11}$. Then the conditional expectation of Y_1, for those who choose to leave, is given by:

$$E(Y_1|X_1,u_3 \leq X_1\beta_1 - X_2\beta_2) = X_1\beta_1 + E(u_1|u_3 \leq X_1\beta_1 - X_2\beta_2) \tag{B-4}$$

We assume that u_1 and u_2 are jointly normally distributed, so that u_1 and u_3 will be jointly normally distributed as well. Heckman [22, pp. 156-157] has shown that:

$$E(u_1|u_3 \leq X_1\beta_1 - X_2\beta_2) = \frac{-\sigma_{13}}{\sigma_{33}^{1/2}} \quad \frac{f(Z)}{F(Z)} \tag{B-5}$$

where $Z = (X_1\beta_1 - X_2\beta_2)/\sigma_{33}^{1/2}$, f is the standard normal density function, and F is its distribution function. We may express equation (B-5) in terms of the moments of the underlying disturbances, u_1 and u_2:

$$E(u_1 | u \leq X_1\beta_1 - X_2\beta_2) = \left[\left(\frac{\sigma_{11}}{\sigma_{22}}\right)^{1/2} - \rho_{12}\right] \frac{\sigma_{11}^{1/2}\sigma_{22}^{1/2}}{\sigma_{33}^{1/2}} \frac{f(Z)}{F(Z)} \quad \text{(B-6)}$$

where $\rho_{12} = \dfrac{\sigma_{12}}{\sigma_{11}^{1/2}\sigma_{22}^{1/2}}$.

Equation B-6 will be positive, so that civilian earnings of those who leave will overstate potential civilian earnings of the entire population, if and only if:

$$\left(\frac{\sigma_{11}}{\sigma_{22}}\right)^{1/2} > \rho_{12} \quad \text{(B-7)}$$

We expect greater dispersion in potential civilian earnings than in potential military earnings, hence $(\sigma_{11}/\sigma_{22})^{1/2} > 1 > \rho_{12}$, and condition (B-7) is satisfied.

Substituting (B-6) into (B-4), we obtain the regression equation:

$$E(Y_1 | X_1, u_3 \leq X_1\beta_1 - X_2\beta_2) = X_1\beta_1 + \alpha \frac{f(Z)}{F(Z)} \quad \text{(B-8)}$$

where α is a positive constant.

If we were interested in analyzing only individuals who leave the military after a single term of service, then we could consistently estimate equation (B-8) using Heckman's two-stage procedure. This would entail first estimating the instrument f(Z)/F(Z), and then regressing Y_1 on X_1 and this instrument for the subsample who chose to leave after one term. Unfortunately, this procedure does not apply to individuals who chose to leave after two or more terms. For example, individuals who leave after two terms have passed through two decision points, and chose to remain in the military at the first decision point but to leave at the second decision point. Therefore, the disturbance

distribution for these individuals is truncated differently than for those individuals who left after a single term of service.

To circumvent this problem, we adopt the procedure advocated by Lee and Trost [18]. We assume that upon entering the military, each individual chooses in advance a date at which he will leave the military. He will leave at date t if and only if his lifetime utility from a strategy of leaving at date t, $Y_t^* = Z\gamma_t + v_t$, exceeds his lifetime utility from leaving at any date $s \neq t$. If he does leave at date t, his observed annual civilian earnings are equal to $Y_t = X\beta + u_t$, where u_t and v_t may be correlated.

The individual will leave at date t if and only if

$Y_t^* > \underset{s \neq t}{\mathrm{Max}}\ Y_s^*$, or

$$Z\gamma_t > (\underset{s \neq t}{\mathrm{Max}}\ Y_s^*) - v_t = \varepsilon_t \tag{B-9}$$

The new random variable ε_t will have a probability distribution function G that is determined by the joint distribution function of the random variables v_s. We may construct the monotonic function $H = F^{-1}G$, where F is again the standard normal distribution function. The transformed random variable $H(\varepsilon_t)$ will have a standard normal probability distribution. Moreover, the condition for leaving at date t may be expressed as:

$$H(Z\gamma_t) > H(\varepsilon_t) \tag{B-10}$$

We may denote the probability of this event by F_t.

For the subsample of individuals who leave at date t, expected civilian earnings are equal to:

$$E\left[Y_t \middle| H(\varepsilon_t) < H(Z\gamma_t)\right] = X\beta + E\left[u_t \middle| H(\varepsilon_t) < H(Z\gamma_t)\right] \tag{B-11}$$

It only remains to specify the joint distribution function of u_t and the standard normal variable $H(\varepsilon_t)$. We will assume that these two variables have a correlated bivariate normal distribution. From equation (B-5), we may write:

$$E\left[Y_t \middle| H(\varepsilon_t) < H(Z\gamma_t)\right] = X\beta + \alpha_t \frac{f_t}{F_t} \tag{B-12}$$

Therefore, if we pool data on individuals who leave during all possible values of t, expected civilian earnings are equal to:

$$E(Y_t) = \sum_{t=1}^{T} F_t \left[X\beta + \alpha_t \frac{f_t}{F_t} \right] = X\beta + \sum_{t=1}^{T} \alpha_t f_t \qquad \text{(B-13)}$$

We see that the selectivity correction involves the T instruments $f_1, \ldots f_T$. Recall that our data consist of cell averages rather than individual observations, so that we could not estimate the f_t from an individual multinominal logit as suggested by Lee and Trost. Instead, we used FY1973 data from the Defense Manpower Data Center to construct the survival profile by term of service for each branch of service and MOS.* If R_t denotes the probability of completing term t conditional upon having completed term $t-1$, then the survival rate S_t is defined as:

$$S_t = \prod_{j=1}^{t} R_j \qquad \text{(B-14)}$$

We set $S_0 = 1$ by convention, and we note that mandatory retirement implies $R_T = 0$ hence $S_T = 0$.

The unconditional probability that an individual will leave the military during term t equals the product of his probability of surviving to the end of term $t-1$ times the conditional probability of failing to complete term t:

$$F_t = S_{t-1}(1-R_t) = S_{t-1} - S_t \qquad \text{(B-15)}$$

It is easily verified that $\sum_{t=1}^{T} F_t = S_0 - S_T = 1$.

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* It would have been preferable to use data from FY1971, but FY1973 was the first year for which the data were available. Moreover, the actual survival rate of, for example, the FY 1965 military entrance cohort would be obtained by multiplying the conditional survival rates in the years FY 1965 through FY 1971. Our procedure is only approximately correct since it replaces longitudinal survival rate history with a single cross-section. Our procedure would be exact only in a steady-state situation in which the conditional survival rates were invariant with respect to calendar time.

We constructed the set $F_1 \ldots, F_T$ for each branch of service and MOS. We then used the inverse of the standard normal distribution function, F, to solve for the ordinate Z_t associated with F_t:

$$Z_t = F^{-1}(F_t) \tag{B-16}$$

Finally, we evaluated the standard normal density function, f, at the ordinate Z_t:*

$$f_t = f(Z_t) = f\left[F^{-1}(F_t)\right] \tag{B-17}$$

* This procedure for constructing the selectivity instrument from grouped data is similar to the procedure followed by Gronau [7], except that his disturbance distribution was only subject to a single truncation.

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This research contribution analyzes the civilian earnings of a group of approximately 24,000 individuals who separated from all four branches of military service in FY 71. We find that potential civilian earnings grow while an individual remains in the military. However, they grow less rapidly than they will once the individual separates from the military. Therefore, the growth in potential civilian earnings is retarded as long as the individual remains in the military.

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